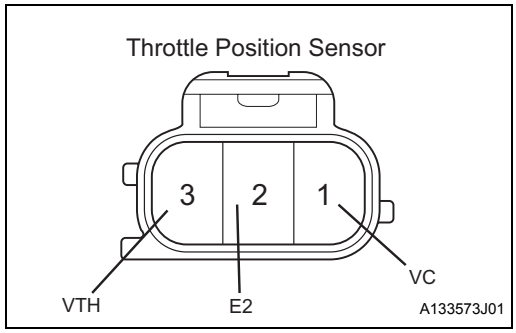
THROTTLE POSITION SENSOR (3SZ-VE)



INSPECTION

1. CHECK RESISTANCE

(a) Disconnect the throttle position sensor connector.

(b) Using a tester, measure the resistance between the throttle position sensor connector terminals.

Standard

Tester Connection (Terminal Symbol)	Throttle Valve	Resistance
1 (VC) ⟷ 3 (VTH)	-	2.5 to 5.9 kΩ
3 (VTH) ⟷ 2 (E2)	Fully Closed	0.2 to 5.7 kΩ
3 (VTH) ⟷ 2 (E2)	Fully open	2.0 to 10.2 kΩ

EFI SYSTEM (3SZ-VE, K3-VE)

DIAGNOSTIC TROUBLE CODE CHART

DTC No.	Diagnostic Item	Lamp	Code Memory	See Page
P0116/42	Coolant temperature circuit range/performance	○	○	ES - 145
P0133/21	Oxygen sensor circuit slow response	○	○	ES - 148
P1115/46	A/C outside air temperature sensor	○	○	ES - 151

ECU DATA LIST / ACTIVE TEST

1. ECU DATA LIST CHART

NOTICE:

- **As the data list values may vary widely depending on slight measurement errors, the measurement environment, or the state of the vehicle due to wear and tear, it is very difficult to indicate specific standard values (reference values).Therefore, in some cases, an error may occur within the range of reference values.**
- **For delicate symptoms such as stumbling, rough idle, obtain and compare multiple test data using the same vehicle under the same conditions, and determine problems wholistically by considering all suspected items on the data list.**

ES

CARB SPECIFIED DATA CHART

Item (Shorted Item)	Item Description	Inspection Condition	Reference Value	Problem Area
Short term fuel trim bank 1 (SHRTET)	•Indicates front O2 sensor feedback trim factor •Displayed range: -100 to 99.2%	2500r/min Constant engine speed	-20 to 20%	OX1 voltage
Long term fuel trim bank 1 (LONGFT)	•Indicates rear O2 sensor feedback trim factor •Displayed range: -100 to 99.2%	2500r/min Constant engine speed	-16 to16%	OX2 Voltage
Total fuel trim bank 1 (TFAK)	•Indicates total fuel trim •Displayed range: 0 to 2	2500 r/min Constant engine speed	0.5 -1.4	Intake system Fuel system Ignition system Exhaust system Control system
Power steering signal (PST)	• Indicates power steering signal input	Steering wheel is centered → turned	OFF → ON	EPS voltage

2. ACTIVE TEST

Item	Condition	Constraint Condition
All VSV	All VSV for purge control are ON (current) / OFF (no current)	

DTC	P0116/42	COOLANT TEMPERATURE CIRCUIT RANGE/ PERFORMANCE

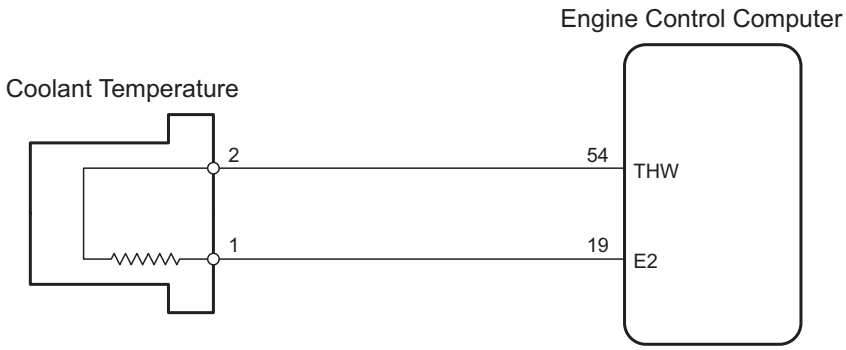
DESCRIPTION

The resistance of the thermistor built into the coolant temperature sensor varies according to the coolant temperature.

DTC No.	DTC Detection Condition 1. Diagnosis Condition 2. Malfunction Condition 3. Malfunction Time 4. Other	Suspected Area
P0116/42	1. IG ON 2. Coolant temperature malfunction 3. When engine speed operates at more than 1000r/min continues more than 10 minutes 4. 1 trip	• Wire harness or connector • Coolant temperature • Engine control computer

ES

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

HINT:

- Read the freeze frame data using the DS-II.Freeze frame data records aspects of the engine's condition when malfunctions occur. This information is helpful when troubleshooting.

1	READ DS-II DATA (COOLANT TEMPERATURE)

(a) Connect the DS-II to the DLC.

(b) Read the engine coolant temperature displayed on the DS-II while the ignition switch is turned to the ON position and the engine is stopped.

Result

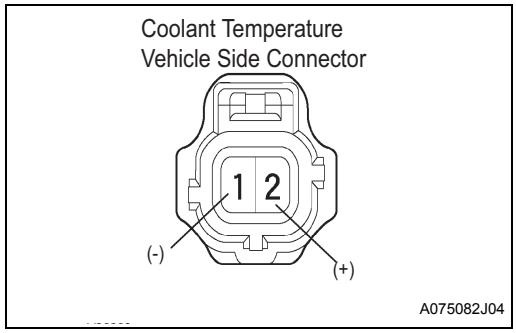
Tester Display	Proceed to
-40 °C	A
120 °C	B
Equivalent to actual coolant temperature	C

B → GO TO STEP 4

C → CHECK FOR INTERMITTENT PROBLEMS

A

2 READ DS-II DATA (INSPECT WIRE HARNESS OPEN CIRCUIT)



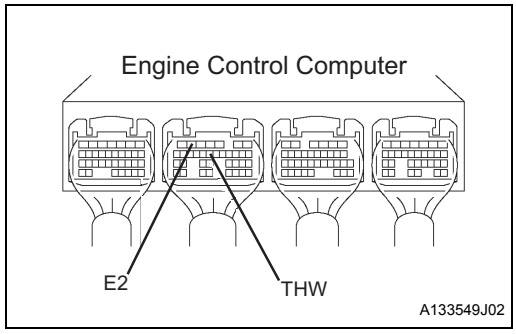
SST 09843-18020

(a) Disconnect the connector of the coolant temperature sensor.
(b) Short the circuit between terminals 2 (+) and 1 (-) of the water temperature vehicle side connector using the SST (diagnosis check wire No.2).
(c) Connect the DS-II to the DLC.
(d) Turn the ignition switch to the ON position.
(e) Read the engine coolant temperature displayed on the DS-II.
Standard:
120°C

OK → REPLACE COOLANT TEMPERATURE SENSOR

NG

3 READ DS-II DATA (CHECK FOR OPEN IN ENGINE CONTROL COMPUTER)



SST 09843-18020

(a) Short the circuit between terminals 54 (THW) and 19 (E2) of the engine control computer using the SST (diagnosis check wire No.2).(For terminal layout, see page ES - 16.)
(b) Read the engine coolant temperature displayed on the DS-II.
Standard:
120°C

NG → CHECK AND REPLACE ENGINE CONTROL COMPUTER

OK

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

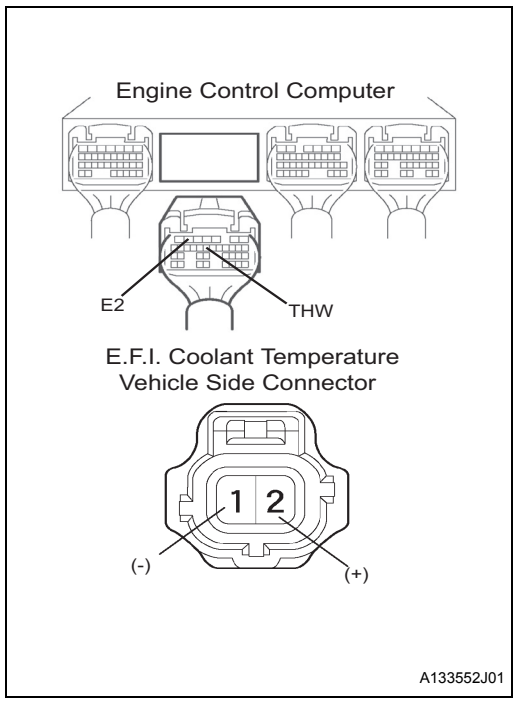
4 READ DS-II DATA (INSPECT WIRE HARNESS SHORT CIRCUIT)

(a) Disconnect the connector of the coolant temperature sensor.
(b) Turn the ignition switch to the ON position.
(c) Read the engine coolant temperature displayed on the DS-II.
Standard:
-40°C

OK → REPLACE COOLANT TEMPERATURE SENSOR

NG

5	CHECK WIRE HARNESS AND CONNECTOR (ENGINE CONTROL COMPUTER COOLANT TEMPERATURE)



(a) Disconnect connector B of the engine control computer and the connector of the coolant temperature sensor.

(b) Using a tester, check whether there is continuity or a short between the vehicle side connector or the engine control computer and the vehicle side connector of the coolant temperature sensor.(For terminal layout, see page ES - 16.)

Standard

Tester Connection (Terminal Symbol) Engine control computer ⟷ Coolant temperature	Standard
54(THW) ⟷ 2(+)	There is continuity and no short between other terminals and body ground
19(E2) ⟷ 1(-)	There is continuity, and no short between other terminals

NG → REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

CHECK AND REPLACE ENGINE CONTROL COMPUTER

ES

DTC	P0133/21	OXYGEN SENSOR CIRCUIT SLOW RESPONSE (BANK1 SENSOR1)

(1) WIRING DIAGRAM

Refer to DTC P0130/21(Oxygen sensor circuit malfunction)

(2) CIRCUIT DESCRIPTION

Refer to DTC P0130/21(Oxygen sensor circuit malfunction)

(3) DTC DETECTING CONDITION

ES

Response time for heated oxygen sensor voltage output to change from rich to lean, or from lean to rich, is more than certain length of time during idling after engine is warmed up.

(4) TROUBLE AREA

1. Air induction system
2. Fuel pressure
3. Injector
4. Open wire or short circuit in the oxygen sensor circuit.

(5) POINT OF INSPECTION

1. Is the signal from the oxygen sensor inputted to the ECU proper ?
2. Is the harness between the oxygen sensor and the ECU proper ?
3. Is the output of oxygen sensor proper ?
4. Are there the open wire or short circuit for the oxygen sensor heater circuit.

(6) INSPECTION PROCEDURE

Read the freeze frame data, using the DS-21 diagnosis tester or OBD I I generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1	Are other codes (those other than DTC P0130/21) outputted?

NO

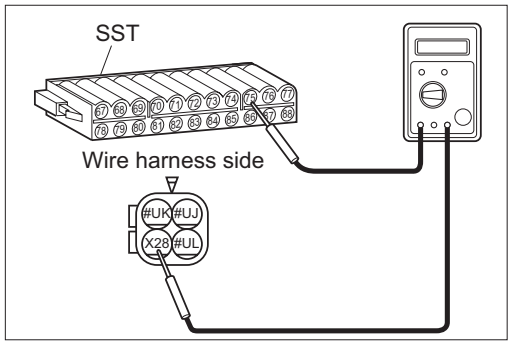
2	Check of harness between oxygen sensor and ECU

1. With the IG switch turned OFF, set the SST (sub-harness).
   However, the SST connectors at the ECU side disconnected.
2. Disconnect the oxygen sensor connector.
3. Check the harness and connector for open wire or short.

·Are the check results for open wire and short between the connector X28 of the oxygen sensor at the harness side and the SST terminal 123 OK?

YES

Go to the relative DTC chart.



L21E3765ES20

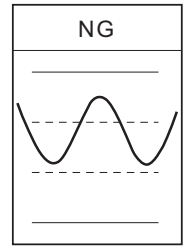
YES

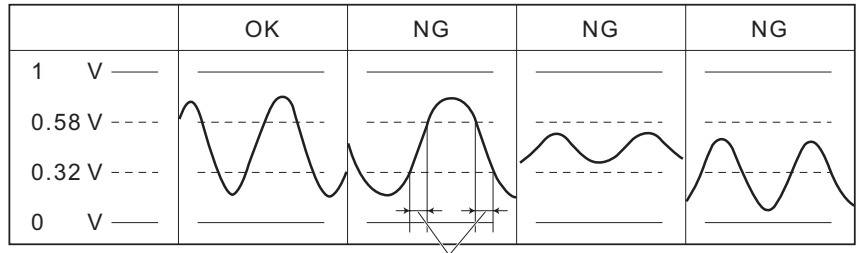
3	Check of output voltage of oxygen sensor during idling

1. Connect the oxygen sensor and SST connectors, respectively.
2. Connect the DS-II diagnosis tester to DLC .
3. Turn OFF all accessory switches. Warm up the engine at 2500 rpm, until the radiator fan starts operating one time.
4. Turn ON the main switch of the tester.
   Read the output voltage of the oxygen sensor when the engine is idling and the radiator fan is not operating.
   Specified Value:
   The voltage varies repeatedly between a range from a voltage below 0.32 V and to a voltage above 0.58 V. (See the diagram below.)

NO

Repair or replace the harness or connector.





NO

4	Check of air induction system

Check the following items given below:
·Check of the engine oil level gauge, oil filler cap and PCV hose for disconnection.
·Check of parts of the air induction system between the cylinder head and the throttle body for disconnection, looseness, or cracks.

YES

Go to Step 8.

YES

5	Check of fuel pressure

Are the check results OK?

NO

Repair or replace induction system.

YES

6	Check of injector injection

Are the check results OK?

NO

Check and repair fuel pump, fuel pipe line and filter.

L21E3766ES48

YES

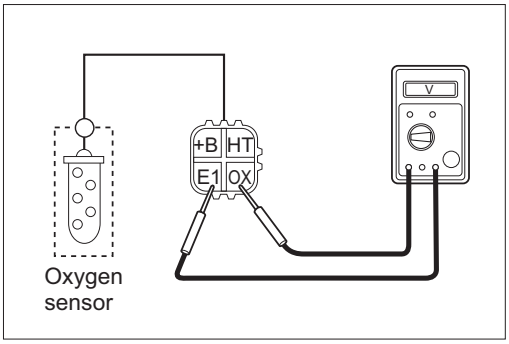
7	Check of output voltage of oxygen sensor unit

1. Warm up engine completely.
2. Disconnect the connector of the oxygen sensor with IG switch turned OFF.
3. Connect a voltmeter to the connector terminal of oxygen sensor.
4. Hold the engine racing speed for 3 minutes at 2000 rpm.
   at this time, ensure that the reading of the volt meter is within the specified value.
   Specified Value:
   Does the voltmeter exhibit an output voltage of 0.2 V or more at least one time?

Are the check results OK?

NO

Replace the injector.



NO

Replace the oxygen sensor. (Bank 1, sensor 1)

YES

Check or replace the engine ECU.

8	Perform confirmation engine racing pattern.

(Refer to DTC P0130/21 chart)

9	Is there DTC P0133/21 being output again?

YES

Check or replace ECU.

NO

Check malfunction that occurs intermittently or poor contact.

L21E3767ES40

DTC P1115/46 A/C OUTSIDE AIR TEMPERATURE SENSOR

DESCRIPTION

The resistance of the cooler thermistor (ambient temperature sensor) changes in accordance with the ambient temperature. As the temperature decreases, the resistance increases. As the temperature increases, the resistance decreases.

DTC No.	DTC Detection Condition 1.Diagnosis Condition 2.Malfunction Condition 3.Malfunction Time 4.Other	Suspected Area
P1115/46	1. IG ON 2. Open or short in cooler thermistor (ambient temperature sensor) circuit 3. Continuously for 0.5 seconds or more 4. 1 trip	• Cooler thermistor (ambient temperature sensor) • Wire harness or connector • Engine control computer

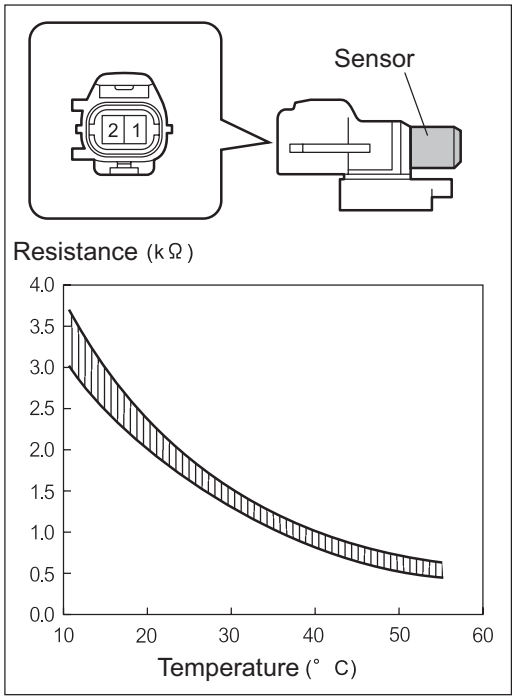
ES

CIRCUIT DIAGRAM

INSPECTION PROCEDURE

1	CHECK COOLER THERMISTOR (AMBIENT TEMPERATURE SENSOR)

(a) Disconnect the connector of cooler thermistor (ambient temperature sensor).



(b) Using a tester, check the resistance between terminals 1 and 2 of the connector of cooler thermistor (ambient temperature sensor).

Standard

Temperature	Standard
10°C	3.00 to 3.73 kΩ
15 °C	2.45 to 2.88 kΩ
20 °C	1.95 to 2.30 kΩ
25 °C	1.60 to 1.80 kΩ
30°C	1.28 to 1.47 kΩ
35 °C	1.00 to 1.22 kΩ
40 °C	0.80 to 1.00 kΩ
45 °C	0.65 to 0.85 kΩ
50 °C	0.50 to 0.70 kΩ
55 °C	0.44 to 0.60 kΩ
60 °C	0.36 to 0.50 kΩ

NOTICE:

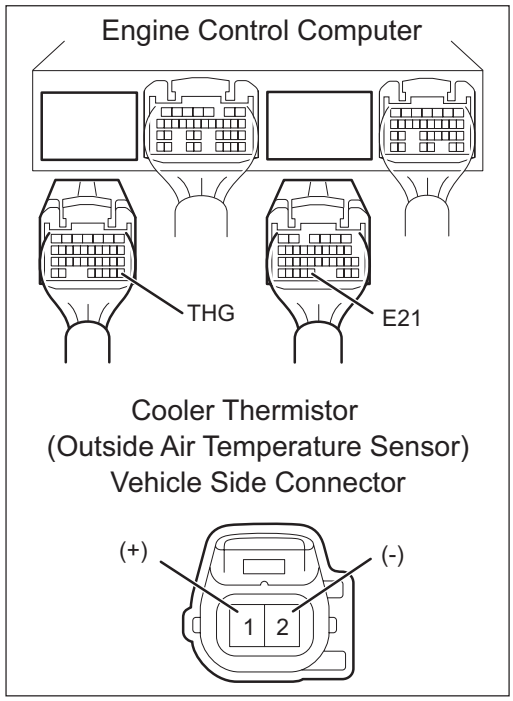
- **If you touch the temperature sensor with your hand, you body temperature will confuse the measurement.Therefore, make sure to hold the connector side when performing the measurements.**
- **Wait until the sensor adjusts to a stable ambient temperature before performing the inspection.**

NG → **REPLACE COOLER THERMISTOR (AMBIENT TEMPERATURE SENSOR)**

OK

2	**INSPECT WIRE HARNESS AND CONNECTOR (ENGINE CONTROL COMPUTER COOLER THERMISTOR [AMBIENT TEMPERATURE SENSOR])**

(a) Disconnect the engine control computer connector C,A and the connector of cooler thermistor (ambient temperature sensor).



(b) Using a tester, check whether there is continuity or a short between the engine control computer vehicle side connector C,A and the connector terminals of cooler thermistor (ambient temperature sensor).(For terminal layout, see page ES - 16.)

Standard

Tester Connection (Terminal Symbol) Engine Control Computer ⟷ Cooler Thermistor (ambient temperature sensor)	**Standard**
129 (THG) ⟷ 1 (+)	**There is continuity and no short between the other terminals and body ground**
116 (E21) ⟷ 2 (-)	**There is continuity and no short between the other terminals and body ground**

ES

NG → **REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR**

OK

CHECK AND REPLACE ENGINE CONTROL COMPUTER